of preserving phytogeographical data for convenient reference, and also for various educational purposes. In this Dr. Clements is the pioneer, and deserves our congratulations upon the success of this first attempt.

It is understood that twenty-four sets (the price of which was very moderate) were prepared, of which all or nearly all have been taken, about a third of them by institutions abroad.

W. F. GANONG.

NOTE ON NEGATIVE DIGITS.

IN the common scale of notation 2873 stands for $2000+800+70+3$. The same number might be represented by $3\bar{1}\bar{3}3$ which is intended to mean $3000-100-30+3$. It might also be written $3\bar{1}\bar{2}\bar{7}$ or $2\bar{9}\bar{3}3$, and, indeed, a great variety of ways might easily be found, but the form $3\bar{1}\bar{3}3$ is most advantageous in that the absolute values of the digits are the smallest possible. It is clear that any number may be written so that all its digits shall be less than six in absolute value. In fact, we may replace 9 by $1\bar{0}$, 8 by $\bar{2}$, 7 by $\bar{3}$ and 6 by $\bar{4}$, leaving the others unchanged. This amounts to replacing the digit K by $10-K$, so that we must add one unit to the adjacent digit on the left. We have then the following rules for changing any digit from plus to minus and from minus to plus:

1. *To change a digit from plus to minus, subtract it from* 10 *and add* 1 *to the digit on the left.*

2. *To change a digit from minus to plus, subtract it from* 10 *and subtract* 1 *from the digit on the left.*

In practice one begins on the right and changes successively those digits which are greater than 5. Thus to change 82755637 the 7 on the right goes into $\bar{3}$ and the 3 becomes a 4, the 6 changes to $\bar{4}$ and the 5 adjacent to it becomes 6, which goes into $\bar{4}$ and makes the second 5 a 6. This goes in turn into $\bar{4}$ and changes 7 to 8 or $\bar{2}$ and the 2 becomes 3. The last digit on the left becomes $\bar{2}$, which changes the digit next to it on the left (namely 0) to 1. The whole process then gives

$$1\ \bar{2}\ 3\ \bar{2}\ \bar{4}\ \bar{4}\ \bar{4}\ 4\ \bar{3}.$$

The reverse process is carried out similarly, and half an hour's practice will enable one to make the change from one notation to the other with little effort of the mind.

The new notation is of little value in addition or subtraction and is entirely useless in division. In multiplication its value, however, can hardly be overestimated. The advantage in using it is twofold. The digits are all less than 6 and there is twice the chance of repeated digits in the multiplier. Thus, in the ordinary method of multiplication, if one has obtained the partial product corresponding to a digit 3 in the multiplier, one obtains the partial product corresponding to a digit $\bar{3}$ by changing the signs of all the digits in the first partial product. In the short method of multiplication given in SCIENCE, July 11, 1902, it is difficult to deal with large digits. Thus, to find the product of 987593×86759 by that method would be a difficult and fatiguing task. Changing to negative digits, however, one finds the product can be written out with perfect ease, thus:

$$\begin{array}{r} 1\ 0\ \bar{1}\ \bar{2}\ \bar{4}\ \bar{1}\ 3 \\ 1\ \bar{1}\ \bar{3}\ \bar{2}\ \bar{4}\ \bar{1} \\ \hline \bar{1}\ \bar{1}\ \bar{4}\ \bar{3}\ 3\ 2\ 4\ 1\ 1\ 2 \\ 1\ 0\ 1\ 7\ \ \bar{1}\ \bar{1}\ \bar{3} \\ \hline 8\ 5\ 6\ 8\ 2\ 5\ 8\ 1\ 0\ 8\ 7 \end{array}$$

D. N. LEHMER.

UNIVERSITY OF CALIFORNIA,
October, 1902.

MUSEUM NOTES.

Part X., Volume II., of the *Annals of the South African Museum* is devoted to a continuation of 'The Moths of South Africa,' by G. F. Hampson. The present instalment, comprising nearly two hundred pages, deals entirely with the large family Noctuidæ, and gives keys to the subfamilies, genera and species. The descriptions are very full and include a great number of new species; the greater number of types are in the British Museum, but the location of all others is noted.

Part II. of the *Memoirs of the Carnegie Museum* contains a detailed description of the osteology of 'Oligocene Canidæ,' by J. B. Hatcher, including *Daphnœus felinus, Pro-*

amphicyon nebrascensis and *Protemnocyon inflatus*, the last two genera and species being new. The author has a well-timed protest against the establishing of phylogenetic relations between species widely scattered in time and distribution. There is one feature about this memoir which demands special attention, and that is the date. This paper appears not to have been distributed until February, 1903, but the date on the cover is September, 1902, an apparent antedating of four months. Mere printing is not publication; an author may print descriptions of new species by the score and stack them away in the attic, but he can not, in such a case, be considered as having published descriptions of these species. In the present instance if, prior to February, 1903, John Smith had *published* descriptions of the two new species included in this memoir, he would justly be the author of those species in spite of the date on the cover of 'Oligocene Canidæ.' And yet the bibliographer, following the title, will credit them as September, 1902. In these days of multitudinous publications it is highly important that they should be correctly dated.

THE 'Report of the Public Museum of the City of Milwaukee' for the two years ending August 31, 1900, shows steady growth of the institution, while the list of accessions testifies to the interest of the citizens. The new custodian, Mr. Henry L. Ward, expresses his desire that the museum should become a prominent educational factor in Milwaukee, and various synoptical series have been commenced with this end in view. This particular province of a local museum is very apt to be neglected and the mistaken effort made to follow along the line of great and long-established museums. A strictly educational museum, unless it be the Children's Museum of the Brooklyn Institute, has not yet been attempted and there is a fine field open here for some one. As Mr. Ward says, it is easy to make such a collection so deep and technical and the labels so long that they are their own undoing, but we should like to see a museum started with the education of the average visitor considered at the outset.

F. A. L.

BEDELL COMPOSITE TRANSMISSIONS.

PROFESSOR FREDERICK BEDELL has, for some years past, been employing the electric light and power transmission lines in telephony, communicating freely wherever those lines extend. He has recently effected an important extension of his system of 'composite' transmission, utilizing a common system of distribution for both light and power transmission and for direct or alternating currents, the latter of any desired frequency. Lighting, requiring a high frequency, and power, demanding low frequencies, the one employing a single, the other a polyphase, system, may be obtained from the same system of distributing wires. The non-interference of asynchronous currents here finds its most valuable illustration. The earlier use of such simultaneous asynchronous currents in multiple-telegraphy and in Bedell's telephony is now carried to its limit by systems of composite transmission for light and power purposes.

The Bedell system includes various methods of simultaneous transmission of direct and alternating currents or of alternating currents of different frequencies. One method permits the transmission of such currents both in the high-tension primary mains and in the low-tension secondary circuits. This arrangement gives an advantage over usual dispositions in the fact that low frequencies in the polyphase circuit insures satisfactory performance of all synchronous machinery, with low line-inductance and improved regulation of e. m. f. and a perfect balance of loads on the different phases.

With this system the motor loads may fluctuate, even to the extent of operating the circuit-breakers on the polyphase generators and system, without affecting the lighting system. The two systems of transmission may be regulated separately and independently, and it becomes practicable to adopt a higher load for each than would be ordinarily permissible. The line drop on the lighting circuit may be compensated by compounding at the generator and the power system of distribution is not limited in its applications by the necessity of considering the working of the lighting system.